

Internet service providers, Web search portals, and data processing services

(NAICS 518)

SIGNIFICANT POINTS

- Projected employment growth varies by industry sector, but all segments should grow faster than the economy as a whole.
- About a third of all jobs are in computer occupations; another third are in office and administrative support occupations.
- About 2 out of 5 jobs are in California, Texas, Florida, Virginia, and New York.

Nature of the Industry

The ability to quickly transmit information over long distances has become an important part of modern life. The Internet has changed the way people find and use information to communicate, work, shop, learn, and live. Internet service providers, Web search portals, and data processing services provide the information backbone of the Internet and World Wide Web. They connect people with information and relay information from people.

Internet service providers (ISPs) directly connect people, businesses, and organizations to the Internet by routing data being sent and received to the desired location. Unlike individual users of the Internet, ISPs must develop and maintain the physical, technical, and contractual connections and agreements with other ISPs to enable the transmission of data. There is no single connection point for the Internet, so ISPs typically need many bilateral and multilateral peering agreements to exchange data through peering points, which are physical connections between the computer equipment of service providers for the purpose of allowing other service providers access to their network of connections. These points-of-presence between ISPs provide a nearly unlimited number of potential connection pathways between data and end users.

In addition to connecting to other ISPs to form the infrastructure of the Internet, service providers must also connect with clients. These clients may range from individual homes to large office buildings. To allow end users to access their networks, establishments in the industry may provide customers with proprietary software, user identification names, e-mail addresses, or equipment. Like telephone or electric service, ISPs offer access to customers on a subscription basis. They may also provide related services beyond Internet access, such as Web hosting, Web page design, and consulting services related to networking software and hardware.

While ISPs connect clients to the Internet by switching and routing data, the physical connections that carry the information to end users are often the wires or cables of telecommunications establishments. The telecommunications industry is covered in a separate *Career Guide* statement.

Web search portals canvas the Web to create databases of content and corresponding Internet addresses in a format that is easy to search. These databases can then be searched by typing key words into a prompt on the search portal's Web site. By using search engines to collect the data and then present it in a usable format, these sites enable users to sort through the huge

amount of information on the Internet quickly. The search engines that find content on the Web automatically follow every link on a Web page to find new pages to catalogue, and then store their location along with text that can be searched at a later point. Because the Internet offers such a vast array of sites, advanced algorithms must be developed to rank the results of a search according to their relevance. Some Web search portals also offer additional services, such as news, e-mail, translation of Web sites, and local business directories. The key distinction of Web search portals is that the information is gathered automatically from across the Web, rather than manually edited and entered into a predetermined directory. Even though the databases are automatically generated, they must be constantly refreshed as new Web sites emerge and existing ones update their content.

Data processing, hosting, and related services are involved primarily in handling large amounts of data for businesses, organizations, and individuals. Data hosting often takes the form of Web hosting, in which Web site content is placed on a server that allows it to be accessed by users over the Internet. While establishments in this industry host Web sites, the content is typically produced by someone else and then made accessible through the Web hosting service. Other data hosting services allow clients to place electronic data, such as streaming music and video or company databases, onto servers that can be accessed directly through specialized computer programs. An additional service provided by this industry is to simply store old data for archival purposes with no Internet access to it.

Data processing covers a broad range of data services, including data entry, conversion, and analysis. Organizations with large quantities of data on paper may turn to data processing services to enter the data into a computer database by hand or by using optical scanners. Similarly, clients may want old data files or several databases converted to a single, more easily accessible format. Aside from converting data to another format, data processing services also produce reports that summarize the data for better analysis by their clients. While most data hosting companies sell subscription services, data processing services companies often work on projects of defined scope.

The Internet is constantly expanding and evolving, and so are the industries associated with it. Due to constantly changing technology and the relatively low additional cost of most new services, companies are frequently upgrading their existing services and offering new ones to attract or retain customers.

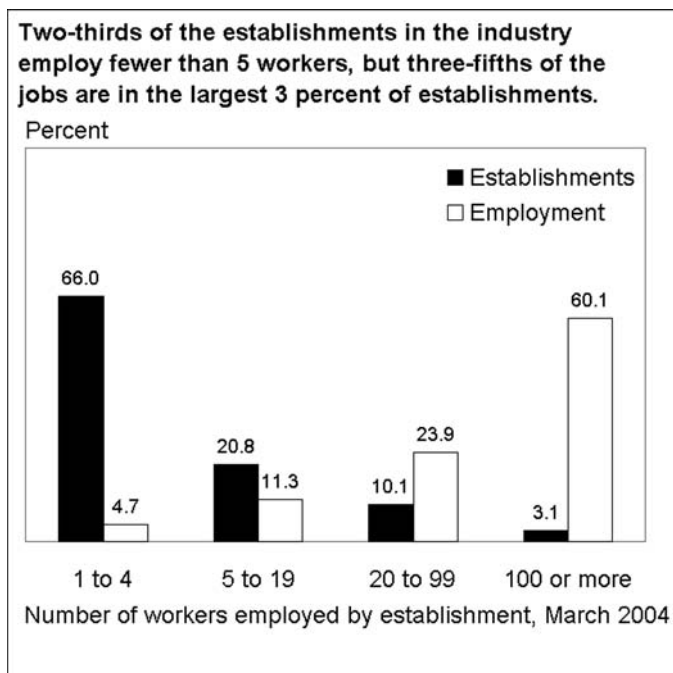
Working Conditions

In 2004, workers in Internet service providers, Web search portals, and data processing services averaged 37.6 hours per week, compared with 33.7 for all industries. The average in Internet service providers and Web search portals was 38.2, while the average in data processing, hosting, and related services was 37.4.

Most workers in this industry work in quiet offices, sitting at computer monitors most of the time. While most usually work a standard 40-hour workweek, there are numerous exceptions. Customer service representatives may work weekends, evenings, or holidays to support customers. As a result, the occupation is well suited to flexible work schedules. Some computer specialists may be required to work unusual or long hours at times to fix problems or perform routine maintenance. In order to minimize the disruptive impact of scheduled maintenance and updates, many Internet service providers and data hosting services perform major work at night or on the weekends. Even though major projects are typically tested before implementation if possible, there may be periods of stress and long work hours before and after implementation deadlines. Similarly, long hours and intense work may be required to fix unexpected problems arising from system upgrades, viruses, or malicious attacks by computer hackers. The very popularity of Web search portals has made them particularly attractive targets for hackers.

Employment

Internet service providers, Web search portals, and data processing services provided 388,000 wage and salary jobs in 2004. Data processing, hosting, and related services accounted for about 70 percent of the jobs, with the other 30 percent in ISPs and Web search portals. Due to the relatively low capital costs of equipment for data hosting services and the geographic distribution of ISPs, 87 percent of establishments have fewer than 20 workers (chart 1). For the same reasons, self-employed workers make up a larger proportion of employment than in most industries.



While this industry can be found in every State, employment is concentrated in a few areas. Just five States—California, Texas, Florida, Virginia, and New York—account for about 40 percent of employment in the industry.

Occupations in the Industry

In order to provide Internet and data services, this industry employs a wide range of occupations. Computer specialists are the largest group and account for approximately 34 percent of wage and salary employment in the industry. With nearly the same employment, office and administrative support occupations make up about 34 percent of jobs. An additional 18 percent of workers are in management, business, and financial occupations, with other occupations accounting for about 14 percent (table 1).

Computer specialists work to develop and maintain the computer equipment and software programs that form the basis of the Internet. *Computer programmers* write, test, and customize the detailed instructions, called programs or software, that computers follow to perform various functions such as connecting to the Internet or displaying a Web page. Programmers break down tasks into a logical series of simple commands for the computer to implement, using programming languages such as C++ or Java. *Computer software engineers*, often simply called *computer engineers*, analyze user needs to formulate software specifications, and then design, develop, test, and evaluate programs to meet these requirements. While computer software engineers must possess strong programming skills, they generally focus on developing logical instructions that are coded by computer programmers.

Computer systems analysts develop customized systems to process data for clients. They work with organizations to solve problems by designing or tailoring computer systems to meet unique requirements and then implementing these solutions. By customizing systems to specific tasks, they help their clients to maximize the benefit from investment in hardware, software, and other resources. *Computer support specialists* provide technical assistance and advice to customers or users experiencing problems. Within this industry, they may provide support either to other employees or to customers by analyzing problems with automated diagnostic programs and through the use of their technical knowledge. These troubleshooters identify problems, and provide technical support for hardware, software, and systems primarily through telephone calls and e-mail messages.

Office and administrative support occupations are involved primarily with the continuation of business processes such as billing, recordkeeping, and customer service. *Customer service representatives* interact with customers to provide information in response to inquiries and to handle complaints—typically by telephone, by e-mail, or in person. Some customer service representatives handle general questions and complaints, whereas others specialize in a particular area. In ISPs, they help new customers set up or discontinue Internet service, but their primary function is not sales. *Data entry keyers* input lists of items, numbers, or other data into computers using keyboards or scanners. They also may manipulate existing data, edit current information, or proofread new entries to a database for accuracy. Nearly all data entry keyers in this industry are employed in data processing, hosting, and related services; relatively few work for ISPs or Web search portals.

Financial, information and record, and general office clerks account for about 16 percent of employment in this industry, or

Table 1. Employment of wage and salary workers in internet services providers, web search portals, and data processing services by occupation, 2004 and projected change, 2004-14

(Employment in thousands)

Occupation	Employment, 2004		Percent change, 2004-14
	Number	Percent	
Total, all occupations	388	100.0	27.8
Management, business, and financial occupations	69	17.7	32.6
Top executives	10	2.6	27.9
Marketing managers	3	0.7	26.6
Sales managers	4	1.0	30.7
Computer and information systems managers	12	3.1	36.8
Financial managers	4	1.0	32.5
Human resources, training, and labor relations specialists	5	1.2	35.6
Management analysts	7	1.7	34.5
Accountants and auditors	5	1.2	30.5
Professional and related occupations	152	39.3	39.5
Computer and information scientists, research	1	0.3	35.4
Computer programmers	22	5.6	8.4
Computer software engineers, applications	19	5.0	56.4
Computer software engineers, systems software	18	4.7	56.5
Computer support specialists	22	5.5	27.9
Computer systems analysts	19	4.8	47.6
Database administrators	4	1.1	47.8
Network and computer systems administrators	13	3.2	50.4
Network systems and data communications analysts	9	2.3	69.2
Computer specialists, all other	4	1.1	30.4
Operations research analysts	3	0.9	14.7
Engineers	4	1.0	32.6
Sales and related occupations	22	5.7	21.4
Sales representatives, services	8	2.1	25.1
Sales representatives, wholesale and manufacturing	7	1.9	29.2
Telemarketers	3	0.8	-8.6
Office and administrative support occupations	131	33.8	13.3
Supervisors, office and administrative support workers	8	2.1	20.0
Bill and account collectors	3	0.7	25.5
Bookkeeping, accounting, and auditing clerks	8	2.0	19.0
Customer service representatives	27	6.9	31.5
Material recording, scheduling, dispatching, and distributing occupations	5	1.2	22.1
Secretaries and administrative assistants	10	2.5	22.3
Computer operators	8	2.1	-23.9
Data entry and information processing workers	20	5.3	5.4
Mail clerks and mail machine operators, except postal service	5	1.2	-29.8
Office clerks, general	14	3.5	20.3
Office machine operators, except computer	7	1.8	-9.8

Note: May not add to totals due to omission of occupations with small employment

about 1 out of 6 workers. *Financial clerks* keep track of money, recording all amounts coming into or leaving a company. They perform a wide variety of financial recordkeeping duties, from preparing bills and invoices to computing wages for payroll records. *Information and record clerks* focus on maintaining, updating, and processing a variety of records, ranging from pay-

rolls to information on the receipt of goods. Customer service representatives are included in this occupational group. *General office clerks* often have daily responsibilities that change with the needs of the job. They may enter data at a computer terminal; operate photocopiers, fax machines, and other office equipment; prepare mailings; proofread copies; and answer telephones and deliver messages.

Computer and information systems managers are the largest of the management, business, and financial occupations, due to the nature of the industry. They plan, coordinate, and direct the activities of computer specialists to ensure that the internal and external computer systems meet the needs of users or clients. Because the industry is primarily engaged in facilitating data transmission over the Internet, these managers work closely with top executives or clients to set schedules for implementing Web sites, performing system maintenance, or installing new hardware and software.

Training and Advancement

The occupations in Internet service providers, Web search portals, and data processing services require a variety of educational levels and specialized training. About 45 percent of workers held college degrees in 2004, while 36 had some college education and another 15 percent held high school diplomas. Entry-level computer and management positions in the industry often require a bachelor's degree in a computer-related field.

Educational requirements have been less rigid for computer specialists than for most other occupations. In the early days of the Internet and Web, many employers struggled to meet ballooning demand for technical workers. However, the growing number of qualified workers and the reduction of demand for computer specialists in recent years have led employers to look for more education and experience when hiring. While employers may seek workers with high-demand skills regardless of formal training in the short term, such conditions are unlikely to last long if they do arise. The general trend has been toward greater demand for workers with computer-related college degrees and more experience. Those with bachelor's degrees in computer-related fields also enjoy greater opportunities for advancement to managerial positions.

Computer programmers typically hold a bachelor's degree in computer science, mathematics, or information systems. Those without bachelor's degrees or degrees in other fields generally take additional courses in computer programming methods and languages. The needs of employers vary extensively and change over time, so a 2-year degree or certificate may be sufficient for some positions if the workers possess the right programming knowledge. Entry-level programmers usually start by updating existing code and advance to more difficult programming. Computer programmers with general business experience may become systems analysts.

Computer software engineers usually have at least a bachelor's degree in computer science, software engineering, or computer information systems. Experience working with a broad range of computer systems is highly valued by employers. Educational requirements vary, with some workers holding advanced degrees in technical fields and others simply completing computer training programs leading to certifications offered by systems software vendors. Because computer software engineers often work closely with computer programmers, communications skills are important in this occupation.

Computer systems analysts and database administrators typically hold a bachelor's degree in computer science, information science, or management information systems (MIS). Many computer systems analysts hold advanced degrees in business administration or technical fields, and becoming certified in various types of systems software may provide a competitive advantage. Relevant work experience also is very important and can be obtained by participating in internship or co-op programs or by working in related occupations. Systems analysts may begin working on one aspect of a system and advance to more complex systems with experience.

Computer support specialists usually need only an associate degree in a computer-related field and experience with computer systems. They must possess strong problem-solving and analytical skills as well as excellent communication skills, because troubleshooting and helping others are such a vital part of the job. Technical support specialists may advance by developing expertise in a particular area, with job promotions typically depending more on performance than on formal education. Some become applications developers, using their troubleshooting experience to design products to be more reliable and user-friendly.

As technological advances in the computer field continue, all computer specialists must keep abreast of developing technologies to remain competitive. Obtaining technical certification is a way in which workers can demonstrate their competency to employers. Certification can be obtained voluntarily through many organizations, and many vendors now offer certification to professionals who work with their products.

Office and administrative support occupations generally require only a high school diploma, but this may vary by occupation and firm. Although some positions may require previous experience in the occupation or industry, many of these jobs are entry level. Some workers in these occupations are college graduates who accept entry-level clerical positions to get into the industry or a particular company. Most companies fill office and administrative support supervisory and managerial positions by promoting individuals within their organization, so those who acquire additional skills, experience, and training improve their opportunities for advancement. However, a college degree is often required for advancement to management ranks.

Customer service representatives typically need only a high school diploma or its equivalent. Because they constantly interact with customers, good interpersonal skills are essential for success in this occupation. Strong problem-solving abilities and basic computer knowledge also are important. Verbal or written communications skills may be more important, depending on whether inquiries will be addressed by telephone, in person, through e-mail, or by letter. Because customer service representatives represent the companies for which they work, employers place great emphasis on a friendly and professional demeanor, as well as the ability to remain patient when dealing with difficult or angry customers. Nearly all employers provide training in basic customer service skills and company-specific services, policies, and systems.

Data entry keyers usually hold high school diplomas or their equivalent and are hired largely based on their keyboarding speed. Familiarity with basic computer operations and with word processing, spreadsheet, and database software is highly desirable. The skills required by data entry keyers can be developed by taking high school, community college, or business school courses; by working for temporary help agencies; and by making use

of self-teaching aids. Attention to detail is important in this occupation, as are spelling, punctuation, and grammar skills.

Financial, information and record, and general office clerks typically need at least a high school diploma. For financial clerks, particularly in the fields of bookkeeping and accounting, an associate degree is often required. While basic computer knowledge and general office skills are required for all clerks, a professional appearance and demeanor are particularly important for those whose work involves frequent interaction with the public. Nearly all financial, information and record, and general office clerks receive some training on the job. Under the guidance of a supervisor or other senior workers, new employees learn company procedures. With experience and training, clerks may be promoted to supervisory or specialist positions.

Computer and information systems managers typically have a bachelor's degree and several years of experience in computer occupations, particularly as computer systems analysts. However, many employers prefer those with advanced degrees in business administration (MBA) or information systems management. In addition to technical knowledge, they must possess strong communications skills and business acumen.

Outlook

Internet service providers, Web search portals, and data processing services are expected to experience 28 percent growth in wage and salary employment between 2004 and 2014, faster than the 14 percent projected for the economy as a whole. This growth will vary by industry sector, with Internet service providers and Web search portals growing at 16 percent, and data processing, hosting, and related services growing at 33 percent.

As the number of people connecting to the Internet continues to increase, ISPs will enjoy growing demand for their services. While the percent of the population connecting to the Internet is unlikely to continue rising at the pace of the 1990s, there should still be a considerable increase stemming from population growth. Changes in the way in which people access the Internet also should drive growth as the demand for wireless connectivity, broadband service, and more points of connection increases. Despite their differences, both urban and rural areas should benefit from this growth, with urban areas expanding wireless networks and rural areas expanding broadband connectivity. The rapid pace of technological advancement in this industry also should generate growth as networks are continuously upgraded to improve performance.

However, consolidation of Internet service providers should temper employment growth in this industry sector, as will the growth of cable and telephone service providers offering Internet access through their networks. When Internet access is coupled with another service, the related employment may be counted as part of another industry, such as the telecommunications industry.

Every day, new content is added to the Web. Sorting through this data and organizing it for search portals is an unending task, and the number of pages grows exponentially. In addition, there are numerous pages that are not accurately catalogued due to the technical difficulties associated with them. The need to keep up with all this content should ensure strong growth for Web search portals over the next decade. Further growth should come from an increase in the number and scope of additional services beyond simple search functions as Web search portals compete for users and look for additional sources of revenue.

As the number of Internet users has grown, so has the number of businesses, organizations, and individuals providing information and services primarily through Web sites. This can range from simple text to retail or subscription music services. Whatever the content, the continuing growth in the number of such sites should drive strong employment growth in data processing, hosting, and related services. Increasing concerns over security also will require more advanced technical solutions, resulting in further job growth within the industry. Both data hosting services and data processing centers also should experience employment growth as the result of the continued need to input paper records into computer files and to convert older, archived data to newer formats.

In ISPs and Web search portals, job opportunities should be best for computer specialists, such as computer software engineers and network systems and data communications analysts. There should be strong continuing demand for these and other computer specialists to maintain and upgrade the systems that keep users connected and the search engines that make the Web navigable. As companies in this industry continue to add services and content, they will need these workers to implement the

Table 2. Median hourly earnings of the largest occupations in internet services providers, web search portals, and data processing services, May 2004

Occupation	Internet services providers, web search portals, and data processing services	All Industries
Computer and information systems managers	\$47.09	\$44.51
Computer software engineers, systems software	36.16	38.34
Computer software engineers, applications	35.63	36.05
Computer systems analysts	33.01	31.95
Computer programmers	31.39	30.24
Network and computer systems administrators	28.57	27.98
Computer support specialists	18.20	19.44
Customer service representatives .	13.88	12.99
Office clerks, general	10.98	10.95
Data entry keyers	9.96	11.18

changes. Demand for computer specialists also should experience solid growth in data processing, hosting, and related services, particularly in Web hosting services.

Earnings

In 2004, nonsupervisory workers in Internet service providers, Web search portals, and data processing services earned \$769 per week on average, compared with the \$529 average for all industries. Workers in Internet service providers and Web search portals earned more, with \$824 as the average. Those in data processing, hosting, and related services earned less, on average, at \$745 per week.

Like those of the entire workforce, earnings also varied considerably by occupation, with workers in professional occupations earning more than those in office and administrative support occupations. For example, customer service representatives and computer programmers—the two largest occupations in the industry—had median hourly earnings of \$13.88 and \$31.39, respectively. As in other industries, managers had higher earnings because they have greater responsibilities and are more experienced than their staffs. Median hourly earnings for specific occupations within the industry are shown in table 2.

Sources of Additional Information

Individual Internet service providers, Web search portals, and data processing, hosting, and related services companies can provide detailed information about job openings and qualifications.

Information on the following occupations can be found in the 2006-07 edition of the *Occupational Outlook Handbook*:

- Computer and information systems managers
- Computer programmers
- Computer software engineers
- Computer support specialists and systems administrators
- Computer systems analysts
- Customer service representatives
- Data entry and information processing workers
- Office clerks, general